UNCLASSIFIED

AD _409195

DEFENSE DOCUMENTATION CENTER

FOR

SCIENTIFIC AND TECHNICAL INFORMATION

CAMERON STATION, ALEXANDRIA, VIRGINIA



UNCLASSIFIED

NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

RUGGEDIZED MICROWAVE DUPLEXING TUBES
PRODUCTION ENGINEERING MEASURES PROGRAM

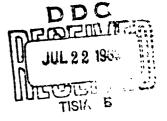
Fourth Quarterly Progress Report
12 December 1962 through 11 March 1963

Contract No. DA36-039-SC-85987

U. S. Army Signal Supply Agency 225 South 18th Street Philadelphia 3, Pennsylvania

MICROWAVE ASSOCIATES, INC.





409195

To a second

E.

No.

Ĺ

I

I

2

QUALIFIED REQUESTORS MAY OBTAIN COPIES OF THIS REPORT FROM ASTIA.

RUGGEDIZED MICROWAVE DUPLEXING TUBES PRODUCTION ENGINEERING MEASURES PROGRAM

Fourth Quarterly Progress Report
12 December 1962 through 11 March 1963

Signal Corps Contract No. DA36-039-SC-85987 Order No. 19037-PP-62-81-81

Contracting Agency: U. S. Army Signal Supply Agency 225 South 18th Street Philadelphia 3, Pennsylvania

MICROWAVE ASSOCIATES, INC. Burlington, Massachusetts

RUGGEDIZED MICROWAVE DUPLEXING TUBES PRODUCTION ENGINEERING MEASURES PROGRAM

Fourth Quarterly Progress Report
12 December 1962 through 11 March 1963

Object: Manufacture JAN 1B63A, 6164, 6334, and broadband X-band crystal protector TR to operate at 350°C.

Order No. 19037-PP-62-81-81

Prepared by:

Paul Basken, Development Engineer

Approved by:

Norman J. Brown, Group Leader

MICROWAVE ASSOCIATES, INC. Burlington, Massachusetts

TABLE OF CONTENTS

		Page No.
1.	ABSTRACT	
2	PURPOSE	2
3.	NARRATIVE AND DATA	•••3
	3.1 Introduction	•••3
	3.2 Fabrication of Preproduction Samples	••••3
	3.3 Life Testing	4
4.	CONCLUSIONS	7
5.	PROGRAM FOR NEXT INTERVAL	8
6.	PUBLICATIONS AND REPORTS	9
7.	IDENTIFICATION OF PERSONNEL	10
8.	LIST OF ILLUSTRATIONS AND TABLES	11

1. ABSTRACT

The manufacture and testing of forty preproduction samples, and the preparation of facilities, equipment, specifications, and personnel for preproduction approval have been the objective of this quarter of the program.

The overall yield was improved to 60%, and complete fabrication procedures and flow charts were prepared for use during the pilot run.

A composite 2000 hour life test was completed on two tubes, indicating that cleanup rates established on single temperature life tests might be valid for composite temperature life tests. The feasibility to use an accelerated 350°C life test to predict accurate life expectancy at lower temperatures is suggested.

2. PURPOSE

The purpose of the contract is to construct and establish capabilities to mass produce microwave duplexing tubes which shall operate satisfactorily under the environmental conditions specified in T ble I, Group VII of Military Standard MIL-STD-446A, in addition to satisfying the respective tube type electrical and mechanical specification. The tube types involved in this contract are: JAN 1B63A, 6164, 6334 and a broadband X-band crystal protector TR.

3. NARRATIVE AND DATA

3.1 Introduction

The fourth quarter of the Production Engineering Measure - from December 12, 1962 to March 11, 1963 - was devoted primarily to the fabrication and testing of preproduction sample tubes.

Originally, the preproduction phase was to end by March 11, 1963. In a meeting held at Microwave Associates on December 17, 1962 with Mr. Stanley Sokolove, USASSA, and Mr. Edward DeCamp, USASRDL, the need for an extension of this phase was realized in order to perform all required testing, including a 2000 hour life test.

The revised schedule, as approved by the Contracting Officer, is as follows:

Preproduction Phase: December 12, 1962 to August 11, 1963

Pilot Run: August 11, 1963 to February 11, 1964.

Figures 1a and 1b present the overall program plan and reflect the revised schedules.

A TAR with preliminary tube specifications was submitted for approval to the Contracting Agency in January.

3.2 Fabrication of Preproduction Samples

As for the second group of forty engineering samples, a total of one hundred tube starts were made for the forty preproduction samples. Again, a careful analysis was made of the shrinkage rates at the various stages of manufacture. In addition, detailed schedules and flow charts were developed for use during the manufacture of the pilot run.

The overall yield for the different tube types was very nearly the same, as can be seen from Tables I, II and III which represent the individual operational yields of each tube type. The fabrication yield, however, is lowest for the dual tube (66%) and highest for the JAN 6164 version (72%), whereas the test yield is reversed. Noteworthy is the exceptionally low shrinkage (only 10%) during the Final Operations which had claimed 20% of the engineering tubes.

The majority of tubes lost during fabrication could be reworked. In particular, the third brazing operation (window braze) was eventually completed successfully on all tubes after removal of the faulty windows. The final yield including reworks was slightly over 60%.

The electrical tests were performed in accordance with the preliminary test specifications. A summary of the test results will be presented in the next quarterly report, as the specifications to which the tubes were tested should be approved by that time.

3.3 Life Testing

During the last quarter, two tubes have completed two thousand hours of life, and six more were placed on life test at a later date.

As has been shown in the third quarterly report, the keep alive discharge limits the life at 350°C to 200 hours due to gas cleanup. The tubes are capable, however, of extended life at lower temperatures. It was indicated in that report, that the effect of 200 hours at 350°C can be equated to a longer period of life time at lower temperatures. Indeed, the life tests performed to that time indicated that the tubes cleaned up the same amount in 200 hours at 350°C as in 1000 hours at

250°C or 2500 hours at 125°C.

Figure 2 is a graph of the average cleanup rate as a function of temperature. From this graph it is possible to predict the life expectancy at any one temperature, but it is not possible to calculate the life expectancy of a tube operated at various temperatures, unless the instantaneous cleanup rate is also known. This rate could be determined by two methods: first, by actually measuring the gas density, and second through the performance of a series of ife tests during which the temperature was varied. The composite cleanup rates could then be mathematically "fitted" to individual cleanup curves.

The life test proposed in the tentative specification is of a composite nature as follows:

 $T = 25^{\circ}C$ for 750 hours

 $T = 125^{\circ}C$ for 750 hours

 $T = 200^{\circ}C$ for 350 hours

 $T = 350^{\circ}C$ for 150 hours

If the average cleanup rate of Fig. 2 were identical to the instantaneous rate, tube cleanup would be anticipated after about 1900 hours, as is shown in Fig. 3. The cleanup of interest here is that of the output section only where the action of the keep alive discharge sets the limitation. The gas fill in this section is adjusted for maximum life with crystal protection, and failure due to cleanup can show up in two ways: recovery time increase due to depletion of the active gases only or keep alive irregularity and crystal burnout due to a decrease of the total gas density below a critical value.

Of the two tubes which completed the two thousand hour composite life test, only one lasted the entire period, although toward the end it showed signs of severe gas cleanup. Table IV presents the life history of this tube. Only one crystal was exposed to the tube during the entire test, suffering a total degradation of 1.5 db in noise figure. The recovery time remained nearly the same during the test, indicating very little cleanup of the input section and also a relatively constant cleanup of all the gases in the output section. This is expected, as the tube wall conditioning process suppresses greatly the chemical reaction of the active gas constituents with the metal surfaces. Leakage power is nearly constant for the first 1900 hours, but then increases rapidly due to the advanced cleanup of the output section.

The second life test tube - summarized in Table V - showed the same behavior for 1900 hours, but failed at 1988 hours, merely 12 hours short of the 2000 hour goal. The failure was shown to be caused by a nearly complete cleanup of the output section.

The results obtained from these two life test tubes indicate that the proposed 2000 hour composite life is more severe than the 200 hour test at 350°C. The indication is that the instantaneous cleanup rate is indeed very close to the average rate. If this is the case - and the six remaining life tests should conform this - the composite life expectancy is only slightly above 1900 hours (from Figure 3). It would also follow, however, that the 200 hour life test at 350°C alone could accurately define the life capabilities of the tubes, and could be used as an accelerated life test sufficient to predict tube performance.

4. CONCLUSIONS

The fabrication of preproduction sample tubes has been completed successfully. As it has been found with the forty engineering samples, the shrinkage rates of the four tube types was fairly constant. Complete sets of fabrication procedures and flow charts have been made as a preparation for the pilot run.

The tubes fabricated conform in all respects to the tentative product specifications described in the third quarterly report.

A composite 2000 hour life test per tentative product specifications on two tubes indicated that the cleanup rates of tures operated at only one temperature might be used to predict composite cleanup rates. More information is needed, however, to confirm the results obtained so far. Six additional tubes are life tested at this time. If the theory advanced in this report holds, it would be possible to replace the composite life test with an accelerated life test at 350°C only.

5. PROGRAM FOR NEXT INTERVAL

During the fifth quarter, the following will be performed:

- 1. Completion of six life tests.
- 2. Submission of a request to finalize a set of product specifications based on all information obtained.
- 3. Testing of preproduction tubes as directed by the testing activity (USASIMSA).
- 4. Completion of manufacturing drawings.

6. PUBLICATIONS AND REPORTS

No publications connected with the contract were made during the interval covered by this report.

7. IDENTIFICATION OF PERSONNEL

Name	<u>Title</u>	Hours Worked
Norman Brown	Group Leader	12
Paul Basken	Development Engineer	90
Roland Cayer	Development Engineer	20
Bernard Corcoran	Engineering Assistant	130
William Anderson	Engineering Assistant	80
Edward Wallace	Model Shop Supervisor	120

8. LIST OF TABLES AND ILLUSTRATIONS

Table I MA 3172 (JAN 1B63A) and MA 3175 (Crystal Protector)

Manufacturing Yield

Table II MA 3173 JAN 6334) Manufacturing Yield

Table III MA 3174 (JAN 6164) Manufacturing Yield

Table IV MA 3172(1B63A) Life Test Data

Table V MA 3174(6164) Life Test Data

Figure la Revised Program Plan

Figure 1b Revised Miscillaneous Reports Program

Figure 2 Average Cleanup Rate vs. Temperature

Figure 3 Cleanup vs. Operational Time for a Composite Life Test

TABLE I

MA 3172 (JAN 1B63A) and MA 3175 (Crystal Protector)

Manufacturing Yield

50 Starts

Preproduction Run

•		•
<u>Operation</u>	Tubes Lost	<u> Yield - %</u>
First Braze	1	98.0
Second Braze	2 (1)*	96.2
Third Braze	5 (5)*	89.5
Wall Treatment	3	93.1
Exhaust	1	97•5
Tuning (mechanical fault)	4	89.7
Fabrication	16	68.0
Electrical Test (low level)	2	94.2
Electrical Test (high level)	3	90.8
Testing		85.5
Short Tipping	0	100
Keep Alive & Exhaust Capping	0 .	100
Grinding & Plating	0	100
Mechanical Inspection	2	93•2
Final Operations	2	93.2
Overall (no reworks)	23	54
Overall (including reworks)	· 19	62

()* denotes tube reworked

TABLE II

MA 3173 (JAN 6334) Manufacturing Yield

25 Starts

Preproduction Ru

<u>Operation</u>	Tubes Lost	<u>Yield - %</u>
First Braze	0	100
Second Braze	2	92.3
Third Braze	<u> ነ</u> (ነ+)*	82.8
Wall Treatment	2	89.5
Exhaust	0	100
Tuning (mechanical fault)	1	94.2
Fabrication	9	66.0
Electrical Test (low level)	; O	100
Electrical Test (high level)	1	93.9
Testing	1	93.9
Short Tipping	1	93.6
Keep Alive & Exhaust Capping	O	100
Grinding & Plating	0	100
Mechanical Inspection	1	93.0
Final Operation	2	87.2
Overall (no reworks)	12	52
Overall (including reworks)	10	60

^{()*} denotes tubes reworked

TABLE III

MA 3174 (JAN 6164) Manufacturing Yield

25 Starts

Preproduction Run

Operation	Tubes Lost	<u>Yield - %</u>
First Braze	1	96.0
Second Braze	1 (1)*	95.8
Third Braze	3 (3)*	87.2
Wall Treatment	1	95.2
Exhaust	. 0	100
Tuning (mechanical fault)	1	94.9
Fabrication	7	72.2
Electrical Test (low level)	2	89.0
Electrical Test (high level)	1	93.8
Testing	3	83.4
Short Tipping	1	93.6
Keep Alive & Exhaust Capping	0 -	100
Grinding & Plating	0	100
Mechanical Inspection	1	93.0
Final Operation	2	87.2
Overall Yield (no reworks)	12	52
Overall Yield (including rework	(s) 10	60

^{()*} denotes tubes reworked

APPROVED

ANTE TE AN CTITUT THAT THIS TEST WAS PERFORMED ACCORDING TO THE COVERMING SPECIFICATION AND HAS PASSED ALL REPTERIMENTS.

SICLED

	ICSE TYPE		MA 3172(1B63	3A)Listonave LI	A CONTRACTOR OF THE CONTRACTOR	LIFE	TEST		1:507	A TABLE	Z E			, . .		, i	
	ST. IAI 3	∄ ;)Ed -	D.JCT.	.o.: DA	TE				GOVE	GOVERNING	SP.C.	1		
	LIFE TIST po=2	3T COLDIS =200kw,	LST COLDITIO S: F=9 po=200kw, prr=1000pp	9000mc, tp=	1. tp=	=1.0µs, Et	ese sur	Ebb=-1000Vdc,	OVdc,	t2=750 H	50 Hrs.		25°C,	t3=350 t4=150	SO Hrs	60	2009C 350°C
	SPTCIAL DATA:	DASA:	TEST	RT(1) µs	RT(1)RT(2) µs µs	PF(1) mw	PF(2) mw	PF(1) PF(2) Ws(1)	Ws(2) ergs	# #			N.F.	CR3	CRYSTAL DATA	DATA	
		· .	XV:	20	20	125	175	0+;•0	0.80	1.0			2.0	1N23E	3E		
			MIN	ı	. '	-		-	1	•			-		· ,		
•	DATE	CLOCY	TIE								•			HOURS	i.k	3	NF
							At	t1=25°C	5°C								
	12-21-62	2595	0	₹•€	_	90	ı	0.23	ı	09.0	* .		,	0	1.25	4.1	6.30
	12-29-62	2786	191	3.0	ı	56		0.22	1				0.0	191	1.21	4.2	6.30
	1-2-63	2980	235	က် က	٠. ١	54	•	91.0	-	,			+.10	285	1.30	0.4	9.40
	1-10-63	3072	477	ν σ	1	9	ı	910	ľ				4.10	1477	1.29	4.1	9.50
	1-17-63	3241:	649	3.0	'	52		910	•	1			약	649	1.21	3.8	5.90
	1-22-63	3359	764	3.0	'	50	1	0.17	-	0.80			30	₩92	1.24	3.8	8.9
							At	t2=412500	12500								
	1-22-03	3359	76+/0	3.0	0.E	50	103	0.17	0.30	0.80			30	494	1.24	3.8	8.9
-	1-28-53	34-8ટ	491/826	3.0	3.0	52	114	0.21	0.32	1			10	928	1.21	4.1	6.20
	2-3-63	3720	1165/401	2.5	2.3	8	110	0.12 c	0.26	1.0			+30	1165	1.40	4.1	9.60
	•													1	1	1	

Page 1 of

MA 3172(1B63A)

APPROVED

THIS IS TO CERTIAN THAT THIS TEST WAS PIRFORMED ACCORDING TO THE GOVERHING SPECIFICATION AND HAS PASSED ALL REQUIRENENTS.

SIGHED

		MA 317<(1363	:]	11.7.2	1. AS:	TCVNVE ASSOC.AL.S		0000	L CO. PORATILE	•	. •		Page 2	2 of 2 EdG.	
	• .				LIFE	TEST	DATA		TABLE	H	cont.			COVIT	
CT. IAI.	#			P.3(Dict	PRODUCTION DATE	TE				GOVERNING	NING	SFLC.		
LIEN IN	: compinon:	10.5:		See	Page	, H		,							
SPICIAL DATA:	DAEA:	12:11	RT(1)	RT(2) µs	PF(1) rw	Rr(1) Rr(2) PF(1) PF(2)	Ws(1)	Ws(2) erfs	당응			N.F.	CRYSTAL	L DATA	
		AX	0.5	20	125	175	07.0	۰ . 80	1.0			2.0		ļ	
		**************************************	•	1		1	1	١	1			ı	1,238	X	
DATE	CLOCK	Tir				•							HOURS VR	21	NF
						āť	+==+	+c=+1250	(co	(cortined)	d)				
2-22-63	1,055	1500/736	2.5	·•.	0	inc	ુ3 €	O-1-C	2.0		.	+-75	54°1 0051	†*† 2	7.05
	-					ht	+=£2	20002							
22-rJ	1.055	1500/0	G A	۲.,	'n.	100	0.36	0.40	c.7			+.75	1500 1.45	ካ• ካ _ 2	7.05
3-5-62	4209	1:5:/1ée	⊋• <u>⊊</u>	4.3	٠٥ .	ბნ	0.30	0.75	0.7		7	+.65	oң• I 999T	ተ• ተ ር	6.95
3-3-63	1+330	1727/257		3.5	ဝွ	700	0.32	09.0				+1.10	1727 1.60	ተ• ተ (04.7
3-13-63	8+1+1	1845/345	2.3	4.0	۱	100	0.48	0.60	0.7			+1.101845	1845 1.60	ተ . ተ 0	7.40
						At t	u	+350°C			·		-		
3-13-63	8444	1845/0	2.3	4.0	오	100	0.48	09.0	0.7			11.10	+1.1018451.60	₹	7.40
3-18-63	4567	1964/119	2.6	3.8	100	300	0.62	09.0	6.0		+	+1.20	1964 1.5	4.6	7.50
3-20-63	6094	2006/161	3.0	6.2	110	300	0.60	0.80 0.95	0.95	·	+	+1.50	2006 1.7	4.6	7.80

Page 2 of

MA 3174(6164) MICADMAVE ASSUCIATES I CURPORATED

TABLE V LIFE TEST DATA

PRODUCTION DATE -

덤

THE COLUMN

THE TYPE

E.iG. COVERNING SPIC.

......... £ 2

LIVE FEE	inal conditions:	١, .	050,	F=9050, tp=1.0µs,		Ebb=-	Ebb=-1000Vdc, tl=750 Hrs	dc, t	1=750	Hrs	s @ 25°C,	, t3	t3=350	Hrs @	200°C	ပ္ခ
						,		ָרְעָי בְּי	2	Hrs @	127	ر. د	27	HIE	350	اد
SPICIAL DAIA:	DATA:	TLST	37(1) ES	RT(2) US	PF(1)	PF(2)	RT(1)RT(2)PF(1)PF(2)Ws(1)Ws(2) US US IN UW ETES ETES	Ws(2) ergs	gp T			AN.F.	.ස ප	CRYSTAL	DATA	
A proper ye	·	::AX	႙	20	100	125	o.⁴o	0.8	1.2			2.0		1N23E		
.		::II:	1	1	_	1	-	1	ı							
DALE	CLOCK	TIME											HOURS	NR	3	N.F.
						At	t1=25°C	2 ₀ C						,		
12-21-52	2535	0	5.C.	1	63	-	0.12	-	99.0			1	0	1.27	7.4	6.65
12-29-62	2786	191	5.1	ı	50	-	21.0	-				+.05	191	1.29	7.4	6.79
1-2-63	2830	205	ic.		03	ı	01.0	ı	ı			15	285	1.21	⊅	6.50
.1-±3-€	30.72	47 7	5.0	i	09	1	01.0	1	. '			+.10	427	1.32	1. 1.	6.75
1-17-63	3244	649	4.5	1	36	1	01.0	ţ.	ı		,	2.0	649 0	3.7	0,1	10.0
1-22-63	3352	76 ¹ +	ن با	. 1	53 83		0.14	١	0.65	·		15	764 115	1.39	0.4	6.55
					·	At	t2=+	t2=+125°¢								
1-22-63	3359	0/492	ў. ф	4.3	28	85	+11°0	0.25	0.65			15	764 115	1.39	٥٠٠	6.55
1-28-63	3483	928/164	4°9	4.3	36	&	0.12	0.22	. 1			+.50	923 279		;±;	7.20
2-8-63	3720	1165/401	1.0	0°:i	52	135	0.12	0.24 0.60	09.0	` .		+.50	1165	1.50	4. 4	4.4 7.20
D .										,				l	i	

R'pld Xtal

THIS IS TO CERTIFY THAT THIS TEST WAS PERFORTED ACCORDING TO THE GOVERHING SPECIFICATION AND HAS PASSED ALL REQUIREMENTS.

SICHED

*XTAL FAILURE DUE TO MISHANDLING

APPROVED

8.7 2.5 7.30 04. % | % to 4.7 7.50 4.6 7.60 4.5 7.30 2.6 1 5.2 CRYSTAL DATA 4.6 3 1845 463 1.60 LYESE 1.50 J. C. 463 1.60 1.9 1.57 9 Sirc 1727 963 1988 606 1845 1,500 37.6 1964 582 1500 730 1,666 202 HOURS DEAD 06.÷ ÷.90 45.0 ÷.39 (5 [] 0, , 1 27 ÷.70 ₩.÷ ** cont :: 0.70 = | 6 72 | 0.0 | 0.24 | 0.65 0.30 0.20 0.70 : 3 % 72 0.0 0.240.65 0.30|0.40|0.70 Γ. ABLE Н 1. <u>ष्ट्र</u> ;; 500 0 1 10 i. ن : C. 0.2 (∵)∻. 15304 = ET At the 350° C 0.19 น [0 + () \(\frac{1}{2}\) \(\frac{1}\) \(\frac{1}2\) \(\frac{1}2\) \(\frac{1}2\) \(\frac{1}2\) \(\frac{1}2\) \(\frac ergg ر 0 LI. TESI DATA PRODUCTION DAFF ľ 100 MEI 1 \ G Ç 3/2 00T 77 See pare 1 \tilde{c} 4.9 + S 100 80 62 : <u><</u> 80 2 2 62 4 12 317'+(6164) #ICHOLAND 门居 0.1 ٠. ب 1988/143 2.5 3.2 **16**3 0 1964/119 2.4 2.6 (7):3 2.2 ·;· es ci C: 1845/345 2.2 1727/227 5) 10) 11/0091 1845/0 YY. L 2500/0 H PINE TEST COMPTETO'S 21 22007) 330 1 1050 5 8411 3-13-63 4448 3-18-63 | 4567 SPICIAL DAINS 3-19-63 4591 . . . 3-13-63 ζ, 2.2.63 1-1-63 TWITTE CATE -42

0

Pa

IN IS TO CIRTIMY THAT THIS COST WAS PERFORNED ACCORDING TO INTITUDE SPECIFICATION AND ASSED ALL RECTIREMENTS.

APPROVED

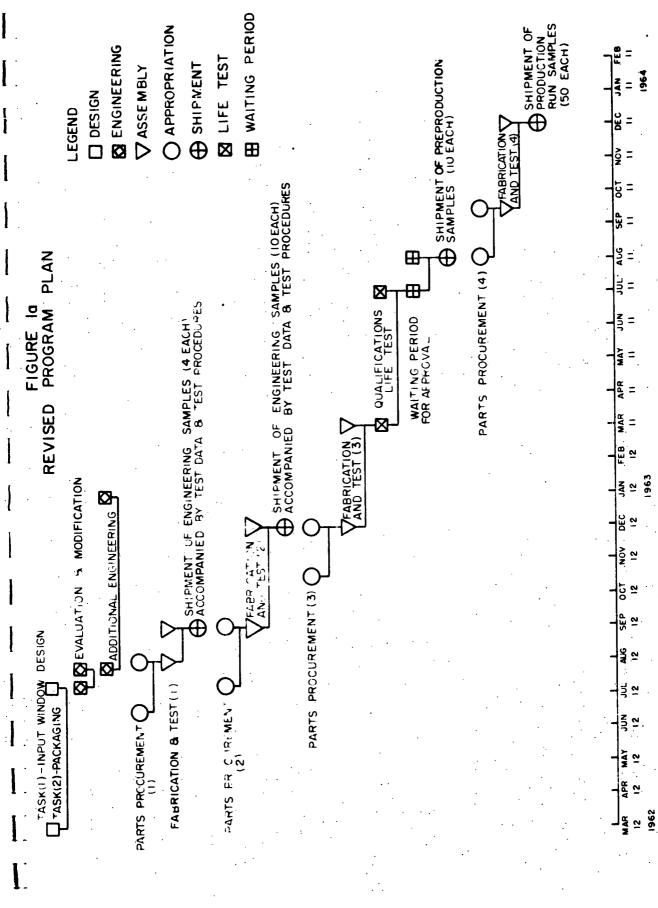


FIGURE 1b REVISED MISCELLANEOUS REPORTS PROGRAM

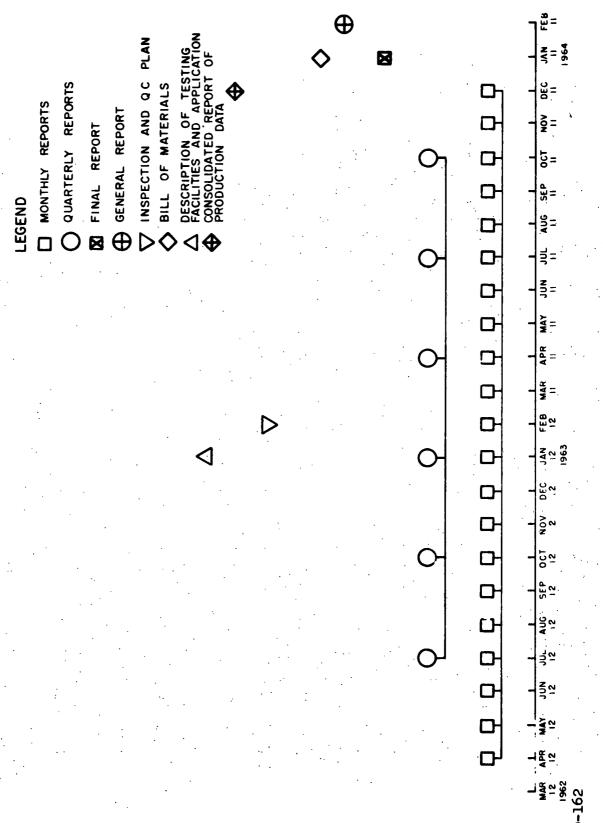


FIGURE 2

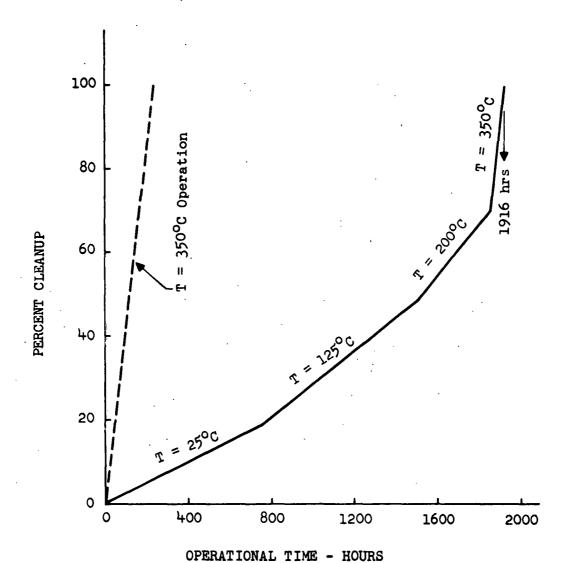


FIGURE 3

CLEANUP vs. OPERATIONAL TIME
FOR A COMPOSITE LIFE TEST

Conditions: $p_0 = 10 \text{ to } 200 \text{ kw}$

 $t_p = 1 \mu s$, du = .001

 $E_{bb} = -1000 \text{ v}, R_1 = 4.7 \text{ meg}$

UNITAS I IND	1. Ruggedized Becrows Dup- Lating Lass Paristic Lass Regimesing Measures Pro- gram 2. Contract Ro. Du 26.09- SC-89987	WCLASSIFIED * Regedized * Crowe's Day- 1 Crowe's Day- 1 Crowe's Day- 1 Crowe's Day- 1 Crowe's Day- 2 Contract * Contract * Contra	
AD Acession Re-	WITSTAND SOCIAIRS, INC. BUILINGTON, MASSACHUS-11S. RUGGED_ZED VICHOWAVE DUPLETING TIPES PRODUTION INCIDENTIAL MEASURES FROMEN P. Basken FOURTH Q arterly Frogress Raport 18 pp Illus Graphs, Signal Corps Contract No. Da36-039-SC-85987 The sanifacture and testing of forty preproduction samples, and the preparation of facilities; equipment, specifications, and personneal for perproduction approval have been the objective of this quarter of the program. The overall yield was improved to coff, and complete fabrication procedures and flow charts were prepared for use during the illot run. The overall yield was improved to coff, and complete fabrication procedures and flow charts were prepared for use during the illot run. The overall yield was improved to signife temperature life that indicating the illotter temperatures is suggested. The overall production is provided accurate life expectancy at lower temperatures is suggested.	MUCROMAVE ASSOCIATES, INC. BUILINGTON, MASSACHATES, INC. BUILINGTON HOROWAVE DUPLEKTING TUDES PRODUCTION ENGINEERING MEASGREE FROGRAM P. Basken Fourth quar erly Pr gre s Report 18 pp Illus Graphs, Signal Corps Contra t No. Dajd-Ojg-gG Sf. The samufacture and testing of forty preproduction samples, and the preparation of f. 11:11, s. eq. p. e., p. ifficat on and personner for preproduction approval have been the objective of this quari- for preproduction approval have been the objective of this quari- for preproduction approval have been the objective of this quari- for preproduction approval have been the objective of this quari- for preproduction approval have been the objective of this quari- for preproduction approval have been the objective of this quari- for preproduction approval have been the objective of this quari- for preproduction approval to the case of this caperature life tests and the be waited for composite Camparature life tests and the be waited for composite Camparature life tests and the be an accelerated 150°C life test to predict accurate life expectancy at lower temperatures is suggested.	
UNCLASSIFIED	1. Pregedized Herchest, Pup- Lexing These Product on Englishest in Measures Pro- 2. Contra-t No. Dal- 50997	UNCLASSIFIED 1. Ruggedised Historowave Dup- paring Thes Production Engineering Heature Pro- gram Example Contract No. Contract No. Contract Sc. Copple Sc	
ADAccession No.	MUGGEDIZED MIGROMANE DUPLEXING TURES PRODUCTION ENGINEERING MEASURES. P. Basken Pourth quarterly Progress Report 18 pp Illus Crephs, Signal Corps Cutract No. Da36-039-8C-85987 The sentecture an, testing of Corps Personal tone and the Transmitted approval have been 'the objections, and personned for p: p: oduct'on approval have been 'the objections, and the Transmitter and the transmitter of the program. The overall yield was 'w.ro.ed to 60%, and complete fibrication procedures and flow chart's w.re prepared for use during the pilot run. A composite 2000 hour life test 'as occident or use during the pilot run. A composite scalablehed or signic testion inducting the tast cleans relating to be wailed for companies and the testion and the clean and the class and the class and the class and the class and the camperature is suggested.	MICROMAYE ASSOCIATES, INC. BULINGTON, BASEACHMESTED. HUGGEDIZED MICHOMAYE DUPLEKING TUBES PRODUCTION ENGINEERING MEASURES FROORAM P. Basken FOURTH Quarterly Progres. Report 18 pp. Illus Graphs, Signal Corps Contract No. 7436-039-8C-85987 The menufactus and testing of forty peeped to sumples, and the preparation of .111fies, equipment, specifications, a d personnel for preparation of .111fies, equipment, specifications, a d personnel for preproduction approval have been the objective of this quarter of the program. The overall yield was superoved to 609, and complete fabrication procedures and flow charts were prepared for use during the pliot Fun. That cleans rates established on signic emperature life tests might be a for compact temperature life tests might be an ac at rates is suggested. The over temperature is suggested. The over temperature is an account of the counts in the expectancy at lose: t.mp.	

Fourth Quarterly Report Contract No. DA-36-039-SC-85987

DISTRIBUTION LIST

	No.	of	<u>Copies</u>
Armed Services Technical Information Agency Arlington Hall Station Arlington 12, Virginia Attn: TICSCA/42740	:	10	
Advisory Group on Electronic Devices 346 Broadway - 8th Floor New York 13, New York		2	
Commanding Officer U. S. Army Signal Research & Development Agency Fort Monmouth, New Jersey Attn: Mr. John Carter		2	
Commanding General U. S. Army Signal Supply Agency 225 S. 18th Street Philadelphia 3, Pa. Attn: Chief, Quality Assurance Operation Division		1	
Commanding Officer U. S. Army Signal Research & Development Agency Technical Information Division Fort Monmouth, New Jersey		1	
METCOM, Inc. 76 Lafayette Street Salem, Massachusetts Attn: Duplexer Division		1	
Bell Telephone Laboratory Murray Hill, New Jersey Attn: Mr. J. Wertz		1	
Commanding Officer U.S. Army Signal Materiel Support Agency Fort Monmouth, New Jersey Attn: Mr. Simon Zucker		1	

No. of Copies Bomac Laboratories, Inc. Salem Road Beverly, Massachusetts 1 Attn: Duplexer Division Canadian Liaison Office Office of the Chief Signal Officer Department of the Army The Pentagon Washington 25, D. C. Attn: SIGEO-CL 1 Commanding General U. S. Army Signal Supply Agency 225 S. 18th Street Philadelphia 3, Pa. Attn: SELMA-R2b Balance of Copies Arinic Research Corporation 1700 K Street, N.W. Washington 25, D. C. 1 Attn: Mr. Robert Strauss